Panel 7 - Testing Considerations for Reuse of Weapons System Components

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Open Architecture is a Navy-wide imperative

Open Architecture (OA) is the confluence of business and technical practices yielding modular, interoperable systems that adhere to open standards with published interfaces. This approach significantly increases opportunities for innovation and competition, enables re-use of components, facilitates rapid technology insertion, and reduces maintenance constraints. The adoption of OA principles is expected to deliver increased warfighting capabilities in a shorter time at reduced cost.

Adoption of NOA principles will led to faster cycle times for delivery of capability to the Fleet at potentially substantial reduction in cost

- Threats from both state and non-state adversaries are changing on an ever-shortening timeline.
- At the same time, competition for pieces of the Navy's budget is also increasing
- Modular designs and software reuse provide the opportunity to provide increased capability to the Fleet on a faster timeline more affordably than in the past

But there are issues that the shortened timelines also create

- The acceleration of delivery of upgrades to the Fleet also results in the need for more frequent testing – which also translates to increased cost to test and certify systems for use.
- Conventional methods require that we perform full regression testing on a system when we change a part of it.
- Similar paradigms also lead to full operational testing being applied to systems that have experienced modular changes.
- This leads to substantial increases in the overall effort and cost of testing – offsetting some of the affordability gains we could otherwise expect.

We need to find ways to control the cost of assuring system reliability.

As we try to reduce the cost of testing, we still need to provide assurance that our mission critical systems perform as required and are safe to operate

- This set of issues led IWS 7 to fund research to provide a solid analytical basis to defining how much testing is needed if a piece of a modular system is changed.
- The two papers presented examine two approaches to dealing with this issue.
- Both papers present good work accomplished to date, and both show that more work is needed to give us the basis for fundamentally addressing how we approach testing (and perhaps designing) systems and architectures.
- NPS was commissioned to do this work because those currently working on our systems do not have time or skills to do the basic thinking and advancing of fundamental knowledge.

This work needs additional sponsorship to move forward

- The sponsorship needed to complete the work is both in funding and participation.
- Funding NPS to do this work provides multiple benefits
  - We involve our next-generation leaders in developing and understanding the knowledge
  - We move the basic science forward and target the research to fit our own problem set
- Providing a target system for a “landing pad” for the system also has multiple benefits
  - The target system benefits from the product much sooner
  - The research benefits from a practical perspective and is therefore more effective

Support for basic research pays the Navy back in many tangible and intangible ways.

Questions for the researchers:

- For Professor Berzins:
  - What is the ideal next step for your research?
  - What is needed architecturally to provide a framework to be able to interchange/replace modules without the need for extensive testing?
  - What timeline is needed to achieve a level of knowledge that can begin to provide real answers we can use?
- For LTC Pfeiffer:
  - Where does the “previous knowledge” of the system come from?
  - Has there been an implementation of this method used in practice that could be used to predict the improvement to be expected in Navy testing?
  - What help do you need to get to a useful product?